

ART. VI.—*On the Occurrence of the Devonian Genus  
Arthrostigma in Victoria.*

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(With Plate III.)

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Introduction.

The genus *Arthrostigma* was founded by Dawson (1871), for stems of vascular character occurring in the Lower Devonian rocks at Gaspé, in Canada. Since that time the form *Arthrostigma gracile* Dawson has been recorded by Kidston (1893) from the Lower Old Red Sandstone of Scotland, and has been found in abundance in the Lower Devonian rocks at Röragen, Norway, being described in detail by Halle (1916).

It is the object of the present paper to record the occurrence of two Victorian forms<sup>1</sup> considered as being within the limits of the species as it occurs in the Devonian rocks of the Northern Hemisphere. The specimens described below were found in a series of beds which have been assigned by Chapman (1914) to his Tanjilian division of the Victorian Silurian rocks, an horizon of younger age than the Wenlockian beds of Great Britain; subsequent work by this author (1924) inclines him to the view that this division may eventually be proved to be of Devonian age. At present a diversity of opinion exists as to the exact age of the beds in question, but it is hoped that, by further stratigraphical and palaeontological work now in progress, their age will be definitely determined.

ARTHROSTIGMA GRACILE (Dawson).

Newell Arber (1921) has stated the characters of the genus *Arthrostigma* Dawson 1871 (loc. cit.) in the following words: "Axis very stout, bifurcating and giving off lateral members, irregularly furrowed or ribbed longitudinally, bearing numerous large and long scattered, straight, sometimes falcate, spine-like organs. Axes possessing a slender central strand of vascular tissue. Fructification unknown."

Halle (loc. cit.) has further examined Dawson's species *A. gracile*, and after a detailed examination of abundant material considers that although there are wide variations in the known

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1.—In a paper by Adele Vincent, B.Sc., "On the Silurian and Devonian Floras and the Importance of their Discovery in Victoria," *Rec. Geol. Surv. Vic.*, iv. (4), 1926, p. 501, that the author has tentatively referred one of the specimens here dealt with to the genus *Arthrostigma*.

specimens, the presence of transitional forms brings them all within the limits of one species. He has in consequence described three subdivisions, which may be summarised as follow:—

A. "In which the specimens resemble Dawson's type specimens." With stems up to 1 cm. broad, leaves with a broad base, which gradually passes over into the stem on the one hand and a narrow subulate upper portion on the other, the leaves being about equal in length and breadth.

B. "Specimens with unusually densely and regularly placed leaves." Stems 15 mm. broad, leaves falcate 6-8 mm. long, forming an angle of about  $10^\circ$  to the axis of the stem, and being placed at a distance of about 3 mm. above each other.

C. "Specimens with thick, short, distant leaves." Stems about 2 cms. broad, leaves 7-8 mm. long, and the same breadth, slightly falcate with an acute but short apex, and about 1.7 cms. apart.

### Description of Specimens.

#### SPECIMEN I.

*Arthrostigma gracile* Dawson, Walhalla, Victoria.

No. 22059, Geological Survey of Victoria. Axis stout, 1.5 cms. broad, bearing a few slightly falcate, spine-like leaves, which arise from the main axis at an angle of  $30^\circ$  and at distances of 1-2 cms. The central strand of the axis is not well defined, and the stem, which is only 6 cms. long, shows no sign of branching. The surface was apparently longitudinally ridged, but the excessive pressure on the rock during preservation seems to have practically obliterated this feature except in a few places.

The small spine-like leaves are 4 mm. long, and at their base have a maximum width of 2 mm., the base gradually passing over into a very short, narrow lamina. No leaf scars occur on the surface of the stem, and a central vein is not evident in the leaves.

The distant arrangement of the small leaves on the stem suggests affinities with the members of Halle's third subdivision of the species (loc. cit., pl. i., figs. 9 and 10). The stem, however, is narrower, and the apparently entire leaves, which are considerably smaller in both length and breadth than those of Halle's specimens, seem to be even more reduced than in the Norwegian forms of this subdivision. The present specimen, though fragmentary, shows definite affinities with *A. gracile*, and until more material is available for further study, it is deemed advisable to regard it as belonging to this species.

#### SPECIMEN II.

*Arthrostigma gracile* Dawson, Bore 1, Rhyll, Victoria.  
Depth 327'/350'.

No. 22373, Geological Survey of Victoria.

The specimen was obtained from a bore core in which the bore core was running obliquely to the bedding plane, so that the

obliquely fractured surface only shows part of the stem on the edge of the core, one half of the stem being entirely wanting.

The portion of the flattened stem remaining has a breadth of 8 mm., and bears a large number of closely arranged narrow, curvilinear leaves. Small rounded elevations are apparent on the surface of the stem, which may be regarded as the thickened basal portions of the leaves. Only a very faint indication of a thin central vascular axis is seen in the upper portion of the specimen.

The small, somewhat flexuous, leaves have a maximum length of 7 mm., and a breadth of 1 mm., but the variations in their length, together with their blunt distal terminations suggest the possibility that they may not have been preserved in their entirety. The bases of the leaves are slightly thickened, and pass gradually back into the stem. The leaves are crowded on the stem, arising at intervals of about 2-3 mm., as measured at the edge of the impression and at an angle of about 35°.

The affinities of the Rhyll specimen lie with the form described by Halle in his second subdivision of the species (loc. cit., pl. i., fig. 8). The size of both stem and leaves approximates to that description, and in the arrangement of the leaves and their crowded nature they coincide almost exactly.

### Conditions of Fossilisation.

It is of interest to make a comparison of the lithological conditions of the beds in which *Arthrostigma* occurs in other countries, with those of the present paper. Dawson's specimens were found "in the sandstones of both sides of the Gaspé basin. The stems were found both flattened and cylindrical, the latter penetrating nearly at right angles."

In Scotland this form occurs in greenish grey flags and thin bedded sandstones of the Lower Old Red Sandstone series, the stems being much compressed.

In Norway *Arthrostigma* occurs in the grey sandstones and slates in the lower and middle part of the series, which consists of 2700 feet of vertical thickness of conglomerates and sandstones, slates and breccias. Halle's specimens were found usually as impressions, but sometimes the original tissue was preserved in a carbonized state, in which material Halle was able to discover by treatment with Schultze's mixture the presence of tracheides of the scalariform type.

Of the Victorian examples, that obtained from the Walhalla district occurs as an impression, with sometimes a vestige of the carbonised tissue, on a fine, closely-bedded light grey shale. The latter has unfortunately, for the preservation of large areas, been subjected to pressure which has caused jointing, so that the rock tends to break into fairly small blocks; but a bedding plane is still predominant, which enables the plant fossil to be naturally preserved.

In the second specimen from Rhyll, the rock in which the fossil occurs is still shale, but strongly indurated and of the texture of a slate. The fossil is well preserved as a carbonized film, the conditions being practically that of anthracite.

In conclusion, I wish to thank the Director, Sir W. Baldwin Spencer, and the Curator of the National Museum, Melbourne (Mr. J. A. Kershaw, F.E.S.), for facilities provided for this work. To Mr. F. Chapman, A.L.S., Palaeontologist to the National Museum, I am greatly indebted for his help, so freely given, during its progress.

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#### EXPLANATION OF PLATE.

- Fig. 1.—*Arthrostigma gracile* Dawson. Walhalla, specimen showing a few scattered emergences.  $\times 2$ .
- Fig. 2.—*A. gracile*, more typical specimen from Rhyll, showing numerous leaf-like outgrowths.  $\times 2$ .
- Fig. 3.—Portion of stem of specimen in Fig. 2, showing surface-markings of leaves.  $\times 2$ .